

Running head: ANALYSIS OF PRE-INCIDENT PLANNING METHODS

An Analysis of Pre-incident Planning Methods: Pictometry, GIS or
CAD Diagramming Software?

Perry S. Howard

Beach Park Fire Department

Beach Park, IL

January 2009

Certification Statement

I hereby certify this paper constitutes my own product, that where language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

Abstract

Documentation of data and activities is an important aspect that any business or governmental agency needs to consider in their everyday activities. The problem is the Beach Park Fire Department (BPFDD) has not identified the electronic tools or the paper forms needed for documentation of pre-incident plans.

The principle initiative of this report was to identify geographical information systems (GIS), pictometry and available software programs for preplanning operations. The action research method was utilized to identify and produce the forms needed to successfully operate a pre-plan program.

The purpose of this research was to identify electronic documentation tools and develop the paper forms needed for a pre-incident planning program in addition to answering; (a) what computer software programs are available for drawing pre-incident plans, (b) what geographical information systems (GIS), are available for use in a pre-incident planning program, and (c) what paper forms are needed for documentation of pre-incident plans?

Procedures included a literature review, a survey of other fire department organizations and a review of other fire departments' documents. Additionally, computer-generated drawings and interactive simulations from experts in their field

were used to demonstrate the use of various computer-based programs. The results identified the need to obtain proven documentation methods and produce the paper forms needed for pre-incident plans. The recommendations are to (a) select a drawing documentation software method based on department consensus and (b) to utilize the hard copy and electronic forms created during this research.

Table of Contents

	Page
Abstract.....	3
Table of Contents.....	5
Introduction.....	6
Background and Significance.....	7
Literature Review.....	9
Procedures.....	31
Results.....	37
Discussion.....	60
Recommendations.....	70
References.....	72
Appendix A.....	80
Appendix B.....	85
Appendix C.....	87
Appendix D.....	95

An Analysis of Pre-incident Planning Methods: Pictometry, GIS or CAD Diagramming Software

Introduction

Documentation of data and existing programs are an important aspect of any business or governmental agency's daily activities (Gaynor, 1998). The importance of good documentation is also a concern among fire departments as it helps identify problems, sets a course for direction and helps mitigate risks in the fire service and emergency medical services (EMS) fields (Allen, 2008). In today's litigious society, documentation of existing fire department programs and processes is a requirement that should be followed to reduce liability, decrease risk and improve the organization.

The problem is the Beach Park Fire Department (BPFDD) has not identified the electronic tools or the paper forms needed for documentation of pre-incident plans.

The purpose of this research was to identify electronic documentation tools and develop the paper forms needed for a pre-incident planning program. The action research method was used to identify; (a) what computer software programs are available for drawing pre-incident plans, (b) what geographical information systems (GIS), are available for use in a pre-

incident planning program, and (c) what paper forms are needed for documentation of pre-incident plans?

Background and Significance

The Beach Park Fire Department (BPFDD) lies in the far Northeast corner of the state of Illinois on the west shore of Lake Michigan protecting a population of approximately 15,000 residents in a 10 square mile fire protection district. The BPFDD is a combination department that provides advanced life support (ALS), ambulance service, fire suppression, inspectional services and public education initiatives to the residents of the district and portions of the Village of Beach Park, IL. The BPFDD also works closely with surrounding departments through participation in automatic aid and mutual aid responses in addition to participating in a county wide specialized response team that includes hazardous materials mitigation, technical rescue and dive rescue services (Lake County Fire Chiefs Association, 2008).

In December of 2006 the BPFDD was awarded a Staffing for Adequate Fire and Emergency Response (SAFER), grant from the Federal Emergency Management Agency (FEMA), which provided the opportunity to hire its first full time personnel in an effort to provide better emergency services to the community. In July of 2008 additional employees were hired through a second SAFER

grant that allowed for the full time staffing of 2 firefighter paramedics (FF/PM) on each shift.

Howard (2008) in a previous research report, identified the need to develop a pre-incident planning program for the BPFD due to the wide range of occupancies in the district that include auto sales, petroleum sales, pet stores, fast food outlets, elementary and junior high schools, a hotel, day care facilities, banking institutions and a variety of personal services stores.

The report established the baselines needed for a program that included naming a lead individual for the program, establishing buy-in from employees, identifying the information needed for a successful program and the development of a pre-plan standard operating procedure (SOP). One of the recommendations from the report was to provide additional research on the subject of pre-incident planning documentation methods for the program (Howard, 2008).

This ARP is the basis of the previous recommendation in an effort to identify electronic tools and methods for documenting a pre-incident planning program in addition to developing the forms needed to operate a fledgling program.

This applied research report (ARP) aligns with the United States Fire Administration (USFA) Executive Analysis of Fire

Service Operations in Emergency Management (EAFSOEM) course terminal objective "to analyze their departments' level of preparedness" and the enabling objective to "enhance the skills and abilities needed to manage the operational component of a fire department effectively" (Federal Emergency Management Agency (FEMA), 2007 p. SM 1-1).

Furthermore, this ARP parallels the United States Fire Administration (USFA) operational objective(s) (b) to reduce the risk to citizens 65 years of age and older by documenting pre-plans of current and future group home and senior living complexes, (c) to reduce the loss of life to firefighters by providing information and training on occupancies and building hazards, and (e) to respond appropriately to emerging issues by developing programs and processes to reduce risk within the BPFD community (United States Fire Administration, 2005).

Literature Review

The beginning phase of a comprehensive literature review was initiated at the National Fire Academy's learning resource center when attending the third year EAFSOEM course. Further research for this project was conducted using internet resources, magazine articles, previously completed research reports and other fire departments' pre-incident planning documents.

Pictometry

Pictometry is a highly accurate photo image produced by low flying aircraft. Pictometry images are produced with a high level of accuracy while providing an oblique angle of 40 degrees. Using LIDAR (LIght Detection and Ranging), technology, images are recorded at up to 100,000 points per second with a high level of precision (5 to 15 centimeters) while providing geo-referenced data. This process allows millions of geographically referenced measurements and data to be collected in a single flight (Pictometry.com, 2008a).

Pictometry International Corporation (PIC) is a Rochester, NY based company that provides the proprietary process of image production that includes the oblique angle (40 degree) elevated photography in addition to orthogonal images. A key feature of the product is that multiple images of a property can be produced (12 to 30 images) during one flyover (Wikipedia.org, 2008a). Pictometry's images differ from orthogonal views, where an orthogonal image is a straight down photographic image similar to what one would identify as a satellite image. (Indiana University, 2008).

Pictometry International's main customer base includes city, county and state governments in addition to insurance, real estate, engineering and utility companies. Additionally,

Pictometry international provides the images for Microsoft's 'birds eye' view of their virtual earth service. (Wikipedia.org, 2008a).

PIC's products are also compatible with ARC-GIS viewer and are available in many different Geographical Information System (GIS) formats (Pictometry.com, 2008b). It is estimated that over 70% of the populated United States has been covered by pictometry's images (Wikipedia.org, 2008a).

One governmental institution, the Franklin Regional Council of Governments (FRCOG), in Greenfield, Massachusetts has offered images to other towns in their county for free. One feature that the FRCOG found useful is the accurate display of latitude and longitude in the imagery in addition to being able to view all sides of a building. Another advantage is that it allows governmental agencies to accurately measure length or height of buildings or distances between structures (Franklin Regional Council of Government (FRCOG), 2006).

Pictometry's use is endless in governmental and business operations. The emergency services fields including fire, police and communication dispatchers can use pictometry to alternate emergency responders routes to scenes, instantly view images, measure height, length or distance of buildings or to provide landmarks to rescuers and law enforcement during critical

searches, surveillance or apprehensions (Genesee County, n.d.). One feature allows for the viewing of street view images that provide a picture of the building in question from the street level (pictometry.com, 2008c).

Significant features of Pictometry for use by fire department personnel include the ability to pre-plan for major incidents by measuring the height of buildings, pitch of roofs, distances between water sources, to view structural components like roof features or access points in addition to viewing potential evacuation routes in an aerial view that may be needed during an emergency (Genesee County, n.d.).

In private industry, Pictometry can be used in real estate to view other local properties, by engineering firms in planning and development of future subdivisions and by environmental companies to identify wetlands, topography and waterways (Blom ASA, 2008).

Geographical Information Systems (GIS)

Geographical information Systems or GIS have been in use for thousands of years. The earliest perceived use of geography dates back to the Cro-Magnon era where it was identified that hunters tracked the migration routes of animals by depicting them on the walls of caves (Wikipedia.org, 2008b; United States Geological Survey, 2008). Early explorers used maps to guide

their expeditions around the continents, seas and oceans. Most recently grade school students have learned to initially read maps, which are a form of a geographical information system that identifies spatial representations of cities, states, waterways and mountain regions. In recent years the modern consumer uses personal navigational devices (PND) such as the Tom Tom, Mio Moov or Garmin Street Pilot to navigate their way through daily traffic or annual vacations (Wired: Blog Network, 2008).

There are many different GIS systems in use today that includes traditional maps, aerial and satellite photos, personal navigational devices and computer software and hardware systems for storing, analyzing, capturing, managing and presenting data (wikipedia.org, 2008b).

The worlds first real operational GIS system was developed in Ottawa, Canada in 1962. It was used to store, analyze and manipulate data for the Canada Land Inventory (CLI). This initiative was established to reference land tracts regarding the soils, agriculture, waterfowl, wildlife and land use on a 1:50,000 scale. The first true GIS was an improvement from the use of traditional map systems as it allowed for the layering of multiple features into one document (Wikipedia.org, 2008b).

One of the leading companies in GIS technology today is the Environmental Systems Research Institute (ESRI) that provides

geographic products for using, storing, analyzing and manipulating data (Environmental Systems Research Institute, (ESRI) 2008a). ESRI as it is commonly known provides free downloads of entry-level products in addition to fee based upgraded programs for reading and using geographical data. ESRI offers products for desktop, mobile and specialized GIS applications (Environmental Systems Research Institute, 2008b).

Several online websites offer geographical data for the consumer that provides directional information, street views of properties and aerial or satellite images. Features of online mapping/direction sites allow an individual to tab between the map view, street view or satellite view to obtain images and directions (Google, 2008; Mapquest, 2008; Yahoo, n.d.).

GIS data is captured from digital satellite images through high-resolution cameras and depict spatial relationships including roads, topography, buildings, waterways and other structures and land forms (Wikipedia.org, 2008b).

GIS digital images can be obtained using LIDAR technology, which is based on radar or infrared laser imaging. LIDAR or Light Detection and Ranging is a sophisticated remote sensing system using a pulsed laser to measure and capture data while in flight (Pictometry.com, 2008a).

Measurements are taken based on the time it takes for the pulsed laser to reach the ground and reflect to the aircraft. Some devices can measure up to 5000 times per second. A determination is made based on the height of the aircraft, its' speed and the time it takes for the pulsed laser to return to the aircraft determining the distance that is computed. These measurements can include topographic information, building heights, mountain elevations, and other information that can be measured. LIDAR is similar in nature to RADAR (radio detection and ranging) in that a pulse is sent out and deflected off an object and a measurement is taken to indicate the distance between two objects (Lidar Services, 2001).

The two main types of geographic models for data gathering are raster and vector models. Raster and vector data provide two separate ways to gather and display geographical data (GIS Lounge, 2008).

Raster data is similar to a digital image and is displayed as pixels or squares that represent a specific area of the image. Combinations of pixels or grid cells create the images that are viewed (City Of Portland, OR, 2008). When raster images are viewed in very high-resolution, small squares, which are the individual pixels can be seen. When viewing magnified digital images, a blocky image may appear along with increased

distortion the closer the image is viewed. (Wikipedia.org, 2008b). Raster images are represented as satellite or aerial imagery and depict continuous features such as differences in surface types (Louisiana Geographic Information Systems Council, 2008). Raster data files consist of rows of uniform cells that are coded by the data values that they represent. Raster images are usually less detailed and generally less visually appealing than vector images (United States Geological Survey, 2008).

Vector images are produced to identify different geographical imagery that are expressed in an image as one of three types of features that includes points, lines or polylines and polygons (Louisiana Geographic Information Systems Council, 2008; Gis Lounge, 2008).

Points represent a geographical feature that can be described as a single point reference such as a well, fire hydrant or highest elevation in a town. Lines or polylines are a one-dimensional object and are used to describe and display features such as rivers, streams, roads, railroads, trails and topographic lines. Polygons represent the two-dimensional features that one would see on a map such as lakes, buildings city boundaries and different land uses. One advantage of vector data is that it can be updated and maintained more easily than raster data (Wikipedia.org, 2008b).

The tools needed to utilize many of the GIS products on the market today, whether they are free or fee based include hardware, software, people and methods. The hardware needed includes a computer, PC, MAC or UNIX to store and drive the software programs. The software for a GIS is dependant upon the needs of the organization and it should provide the functional tools to analyze, store and display graphical information (Louisiana Geographic Information Systems Council, 2008).

The people and methods needed to utilize a GIS include properly trained and qualified individuals with the technical expertise to operate, analyze, create and display data. The methods should include a management system with a well-defined plan to operate within approved business models and practices (Louisiana Geographic Information Systems Council, 2008).

While GIS data has many capabilities and uses, benefits and changes can take considerable time to come to fruition. GIS is not suitable for all governmental uses and it can take years to see the benefits. Extended time requirements are essential to building a database, training users and making changes in the organization. Some disadvantages to using a GIS are the potential costs to develop a GIS program, access to imagery and staff support. To offset costs, multiple agencies can enter into joint agreements to cost share and train their employees

(Massachusetts Office of Geographic and Environmental Information, 2007).

The USGS satellite sensor (Advanced very high resolution radiometer, AVHRR) for identifying normalized vegetation index has the capability to analyze the amount of energy reflected from the earth's surface at a 1 Kilometer resolution twice each day. This process helps determine drought measures related to lag time between lack of rainfall and its' affect on crops. The USGS spatial resolutions occur with closer precision at less than 1 meter (United States Geological Survey, 2008).

GIS programs have been in use in the wild land setting for many years. A project by Missoula County, Montana has utilized GIS to dramatically improve firefighting methods for many years. The GIS system identifies hydrants by location, water flow calculations, risks and hazards, roads, bridge capacities, land slopes and differing interface materials. Multiple layers are loaded into the GIS that include structures, neighboring fire district boundaries, land use and slope in addition to inherent hazards and risks (Close, 1993).

Patterson (2007) identifies how far the use of GIS has come in the fire service. A GIS can be displayed on a dispatchers console, in a vehicle-mounted computer or on a handheld device. Currently dash mounted Global Positioning System (GPS)

receivers, cameras and satellite phones are available for use in documenting real time data and information. In field crews can capture and forward real-time developments including fire progression, alternate escape routes, land topography and water supplies.

One interesting feature available to the fire service is to integrate a GPS and GIS system with the use of digital radios. This enables the transmission of coordinates to others on the same frequency. The progression of a fire and its perimeter can be identified by crews on the ground or by aircraft flying the perimeter when using the integrated technology which then can be viewed on fixed computers or handheld devices (Patterson, 2007).

Software

GIS Software. There are many different types of software and suppliers on the market that distribute products for use in desktop, mobile and fixed computer systems. The United States Fire Administration, (2003) identifies, but stops short of recommending several GIS software producers that includes ESRI's Arc View, MapInfo's MapInfo, Caliper's Maptitude, Intergraph's Geomedia and Tactician's Tactician products. Other commercial products on the market are NewComTech's Voyager (Newcomtech, 2008), Group 1's Remote Access (Group 1 Solutions, Inc, 2008)

and On-Scene Xplorer's 2.6 bundled with Iron Compass (On-Scene Xplorer, 2008).

Other companies that offer open source GIS products are GRASS GIS, Quantum GIS, MapServer, uDig, OpenJUMP, gvSIG, OSGeo and Google Earth. Functional GIS libraries include GDAL/OGR and Geo Tools. PostGIS provides open source alternatives to geodatabases such as Oracle Spatial and ArcSDE (Wikipedia.org, 2008b).

ESRI provides a full range of software for using, displaying, analyzing and creating GIS data. ESRI offers the free ArcExplorer which is a data viewing software and allows the user to download, display, query and retrieve map data. Free imagery, topographic data, historical maps, street maps and physical features are projected on the images available. The ArcExplorer is downloaded as many as 8000 times per month and is available in Windows or Java editions from the ESRI website (Environmental Systems Research Institute, 2002).

The three main products that ESRI markets are Arc View, Arc Editor and Arc Info. The entry-level product Arc View allows the user to create maps, multiple map layers and templates, interactive maps with spatial or non-spatial characteristics, view CAD data and satellite imagery, generate reports and charts in addition to being able to directly import up to 70 different

formats that are compatible with the Arc View product (Environmental Systems Research Institute (2008c)).

Arc Editor provides all of the benefits of Arc View in addition to adding tools to edit, create and ensure the quality of the data produced. Arc Editor also allows the user to link map text to tables, add dimensions to your maps, create spatial data from scanned images and perform raster and vector conversions. Another feature of this upgrade is it allows multiple users to simultaneously work, save and modify data to map layers without losing information (Environmental Systems Research Institute, 2008d).

The Arc Editor product includes 24 GB of data and provides basemaps and thematics for all of the U.S., Canada, Europe and Mexico including U.S. census geography and ZIP Code data. Commercial data is included from other mapping services like Tele Atlas, DMTI Spatial, WorldSat, EarthSat, World Wildlife Fund and Eurographics to name a few (Environmental Systems Research Institute, 2008d).

The Arc Info product is the top of the line GIS application that has all of the features of Arc View and Arc Editor in addition to providing advanced spatial analysis tools for data manipulation and high-end cartography (Environmental Systems Research Institute, 2008e). The advanced Arc Info performs

raster processing and conversions, creates personal or multi-user geo databases and converts polygon figures to line features allowing the smoothing of lines and grid features. The high-end cartography feature includes predefined map templates for professional production of maps and offers advanced drawing tools and symbols for customizing thematic layers for highly developed and professional maps (Environmental Systems Research Institute, 2008e).

Diagramming Software. Several companies market computer aided drawing (CAD), and diagramming software for drawing shapes, plot plans, roads, evacuation plans and building plans. Popular drawing program used in the fire service include Cad Zones' Fire Zone, Microsoft's Visio and On-Scene Xplorer's 2.5 and 2.6 mapping and pre-planning software. Many GIS software companies offer the ability to draw outlines of buildings and structures as well, but some do not have the capability to draw floor plans and building specific information.

Cad Zone offers several products that include First Look Pro and the Fire Zone CAD product in addition to their Crime Zone software product for use by law enforcement agencies. First Look Pro allows the consumer to create a database and search for pre-plans by name, address or other identifying parameter in addition to viewing all preplans. The Fire Zone product is the

CAD diagramming software that is used to produce the actual drawings of buildings, footprints or plot plans used in the preplan (Berry, 2008).

A fire inspector at the Fort Worth, TX Naval Air Station reveals the ease of use, quickness in obtaining information and the ability to edit existing drawings as advantages of the Fire Zone software. The software is easy to train on, is user friendly and simple to use compared to other diagramming software (Cad Zone, 2008).

A logistics Sergeant in California noticed the drastic difference the Cad Zone software provided over the traditional pencil and paper method previously used. The new preplans looked more professional, provide standardized symbols and lines and lettering is straight and legible. This product is also useful for completing drawings for post-incident briefings and reviews (Cad Zone, 2008).

Microsoft Visio is a CAD drawing program that runs in the Office 2007 suite produced by Microsoft. A 60-day Trial offer is available to users for free with a purchase price of \$259.00 for the standard version and \$559.00 for the professional version (Microsoft, 2008a). Visio Standard allows you to produce business related diagrams like flow charts, organization charts and project diagrams. Visio Professional maintains all the

standard features but adds the ability to create building plans, network, software and web diagrams in addition to engineering and technical diagrams (Microsoft, 2008b).

On-Scene Xplorer is a company started by a former Mapquest employee that coordinated the needs of a local fire department into a mapping and pre-incident planning program. The On-Scene Xplorer product provides a mapping and pre-incident planning component that was built on a format that consulted the NFPA Standard 1620: Recommended Practice for Pre-incident Planning (On-Scene Xplorer, 2008a).

On-Scene Xplorer's mapping can display streets, building footprints, hydrant locations and GPS coordinates. Pre-incident planning information provides for the quick access to retrieval information, utility shut offs, hazardous material locations, occupancy issues and suppression systems (On-Scene Xplorer, 2008b).

Mapping Solutions Inc (MapSol) is a software provider to public safety and the telecommunications industries. Mapping Solutions partnered with GiveMePower Corporation a leading graphics software company to produce the FIREbasePIP Emergency services pre-planning software. FIREbasePIP can be installed on central computing devices like servers and computers in addition to mobile computers and terminals to provide emergency workers

with up to date pre-plans, evacuation routes and maps (Findarticles.com, 2008).

MapSol's mapping software is based on individual fire departments local, city, county or regional GIS and map data (Mapping Solutions Incorporated, 2008a). In addition to providing mapping information, FIREbasePIP can also create custom detailed drawings of commercial buildings and site plans (Mapping Solutions Incorporated, 2008b).

Mapping Solutions FIREbasePIP is reasonably priced at \$495.00 and is based on GiveMePower's CAD software system (Findarticles.com, 2008). FIREbasePIP is based on a dwg file format that is used by over 90% of the architects and civil engineering firms in America (Mapping Solutions Incorporated, 2008b).

The Bode Research Group (BRG) (2004a) offers an add on graphics package that works with Microsoft's Visio products. The FireLine graphics package supports detailed black and white or color drawings and graphics. BRG recommends the Visio standard package but identifies that the upgraded professional version will also work with the FireLine Graphics program. The graphics allows the user to produce professional graphics for map books, pre-incident plans, fire critiques and tactical worksheets.

John Bode identified the ease of use and professional looking floor plans and maps he was able to produce in a short period of time using Visio 2000. The Visio program had a large variety of shapes, stencils and symbols for use in making drawings and maps. Visio offered an easy drag and drop format within the program (Bode Research Group, 2004b).

The combination FireLine and VISIO program offers over 1000 symbols, shapes and images including NFPA and DOT symbols, various fire apparatus options, tool and equipment features and tactical worksheets. The product allows the user to imbed Visio drawings into other programs using the OLE functionality of the product (Bode Research Group, 2004b). The FireLine graphics program is \$129.00 and requires either the Visio standard or professional version to run (Bode Research Group, 2004a).

Electronic and Paper Documentation Methods

There are many different options available for documenting pre-incident plans including electronic and paper formats. First Look Pro provides an inspection form for use in obtaining information that integrates with their Cad Zone product. The First Look Pro form can be viewed in an electronic format for ease of operation at an emergency scene, or it can be printed in hard copy form to be used as a form fill-able document in the field (Cad Zone, 2008).

The Kingsville (Ontario, Canada), Fire Department utilizes First Look Pro to categorize their pre-incident planning information for various occupancies. The form is broken down into sections that include occupant information, structure information, access information, hydrant information, HazMat information, strategy information and contact information. The form is fairly straight-forward and is visually appealing (Kingsville Fire Department, 2006).

The Tempe, AZ Fire Prevention Division (TFD), provides a pre-plan new construction packet to builders in an effort to provide valuable information to the fire department prior to construction. The recommended format for drawing compatibility is either a DWG format or AutoCAD Light 2002 edition. The TFD packet requires a scaled drawing, street location(s), hydrants, fire alarm panel, FDC and riser locations in addition to utility locations and roof access points (Tempe Fire Department, 2008).

The Mercer County (Kentucky), Fire Department (MCFD), utilizes a combination building inspection and pre-Plan form for obtaining information. The MCFD form requires occupant, structure, access and water supply information. Additionally, an area for hazardous materials information, emergency contact information and a sheet of graph paper is included to provide a

pre-plan sketch of the premise (Mercer County Fire Department, 2006).

The Delta Fire and Emergency Services Department in Delta, British Columbia Canada provides a guideline sheet of information for pre-plan completion in addition to supplying a Visio template, a pre-plan flow sheet for directions and a data sheet for obtaining critical building and occupancy information (Delta Fire & Emergency Services, 2004).

RealView LLC (2007) offers Commandscope, an on-line mobile, internet based inspection and pre-plan solution option for pre-plan information that can be directly accessed by the citizens for documenting residential pre-incident plans. The Commandscope product allows the fire department to specify questions for residents to provide a basic pre-plan of information on their property. The North Aurora, Illinois Fire Department is the first to utilize this product. One benefit of the product is that whether it is used for inspections or pre-plans, the product automatically updates pre-plans on all system computers (North Aurora Fire Protection District, 2007).

The International Association of Firefighters (IAFF) offers a Hazardous Materials training manual for the technician level where they identify the importance of pre-incident planning. The IAFF training materials provides a sample pre-incident planning

form that outlines the critical information that should be available to emergency responders. This information includes providing location, owner, agent and building information in addition to suppression system, roof and building construction and special hazard information. Due to the fact that the training document is for hazardous materials mitigation training, special information includes steps to take in case a major spill occurs in addition to identifying other target hazards to be evacuated (International Association of Fire Fighters, n.d.).

Table 1 represents cumulative data reproduced from a previous Applied Research Project (ARP) that identified many items and categories of information that could be included as information to emergency responders in the form of pre-incident planning documents (Howard, 2008).

Table 1

Pre-incident plan worksheet information			
Occupancy	Operations	Ownership	Location
Construction type	Height	Width	Length
Roof construction	Material/type	Access	Scuttles
Elevators	Shafts	Stairwells	Dumbwaiters
Exits	Entrances	Doorways	Skylights
Fire Alarm	Panel	Annunciator	Location

Detection devices	Pull stations	Smoke	Heat
Automatic Devices	Sprinklers	Detectors	Fire pumps
Fire protection	FD connections	Stand pipes	Risers
Extinguishing system	Wet	Dry	Coverage
Utility location	Electric	Gas	Water
Special hazards	Storage	Chemicals	Fuels
Alternative Energy	Generator	Fuel	Power
Water Supply	Hydrants	Shutoffs	Draft pits
Life safety concerns	Occupancy	Egress	

The literature review provided substantial information about different GIS and CAD diagramming software programs that are available for use in a pre-incident planning program. Through the literature review, Pictometry, which was an unknown concept to the author, revealed many more uses and options that are available to emergency responders and supervisors.

Several advantages and disadvantages of the different products were identified through the literature review that included the cost of products and programs, ease of use, accessibility, tools and equipment needed, training required of the different programs and a variety of different forms that are currently in use by other fire departments.

Procedures

The procedures used to complete this research project included a literature review, a survey of other departments, an interactive webinar, viewing Pictometry and GIS demonstrations by professionals in their fields, viewing a tutorial on GIS from FEMA and an evaluation of CAD diagramming software products by BPFDF line firefighters.

Literature Review

A literature review was initiated at the National Fire Academy's learning resource center and continued with a review of fire service books, articles and various internet websites.

Survey

An e-mail was distributed to 24 different training officers in our 2 county Mutual Aid Box Alarm System (MABAS) division requesting their participation in a 10-question survey (Appendix A). The e-mail provided specific instructions to complete the survey or forward the survey link information to the individual responsible for pre-incident planning in their fire department.

Local fire departments in our area were chosen for the survey so that additional information could be obtained, if needed, after the survey information was tabulated. The training officers of each department were chosen in the process for sample selection as they are an identified group that holds

quarterly meetings and that each one has a vested interest in their organization.

The online survey site SurveyMonkey.com was used to collect and tabulate results for this research. The survey was primarily used to identify what GIS or CAD drawing programs were in use by other organizations in our local MABAS division.

The 10 question survey gathered information on the type of department, dedicated pre-plan program information, formatting of pre-plan documents, informational forms used for obtaining data, how pre-plans are drawn, what type of GIS or CAD drawing program is used, what type of other CAD programs the responder has used and any feedback they could provide in addition to identifying which department they represented for the survey.

Webinar

A webinar (internet web conference) demonstration was implemented by a representative from Pictometry.com in an effort to learn the features and components available through the use of their product. Pictometry.com was contacted through their company's internet contact us link and a representative set up an interactive webinar date to demonstrate Pictometry's uses and to answer questions about their product. A date was scheduled 2 weeks in advance to offer the interactive demonstration to all BPFDD members. The questions posed to Jeremiah McGrath, a

representative from Pictometry.com were (a) what pre-plan applications are available for fire and emergency service agencies, (b) what are the benefits of Pictometry, (c) where could pre-plan documents be saved, (d) how often are the images updated, (e) what is the cost of implementing or using pictometry.

GIS Product Demonstrations

Two demonstrations were arranged with organizations that utilize GIS information for this research. A demonstration of a commercially sold product supplied by New Com Technologies, INC was arranged through a representative of their company. Newcomtech.com was contacted through their web contact page and a representative called to arrange a meeting to display and demonstrate GIS products that can be used in either a mapping or pre-incident planning program. The questions posed to Jeffrey Doty, New Com Tech representative was (a) What products do you have that would be useful to an emergency service agency for preplanning activities, (b) What format does your product use for pre-planning information, (c) what is the learning curve for your product and GIS applications, and (d) what is the cost of your product.

A demonstration of a GIS Arc-View product was arranged through the local county GIS department that currently uses the

most up to date GIS information on a daily basis. The Lake County GIS Department was contacted and arrangements were made to meet with the director and a representative of the department to answer the following questions (a) what are other fire departments using GIS data for in our county, (b) what software would be required to use the data available through the Lake County GIS department, (c) what is the learning curve for using Arc-View, (d) what type of training would be available to use the products that our county uses.

GIS Tutorial

A GIS tutorial CD was obtained from FEMA when attending the EAFSOEM third year Executive Fire Officer course. A FEMA publications request form was obtained, filled out and submitted to obtain order # 0-0602 Geographic Information System (GIS) Tutorial (CD-ROM) FA-259.

CAD Diagramming Software Evaluation

Two products were utilized in an attempt to determine the advantages and disadvantages of the different products. Cad Zones Fire Zone product was evaluated in addition to Microsofts' Visio drawing product.

The Cad Zone Company was contacted through their web page evaluation link to receive a free download or CD of their Fire

Zone product. A free evaluation copy of both Fire Zone and First Look Pro were requested for evaluation.

The Microsoft Visio product was previously purchased by the BPFDD and placed on two computer desktop units. Although this product has not been used for pre-incident planning procedures in the department, an evaluation of the product was completed to compare it to the Fire Zone product. It should be noted that Microsoft also offers the basic Visio product on a free trial basis.

A 3 day training session was set up for each product (Fire Zone and Visio) which followed with a 3-day company level training to allow each shift the opportunity to utilize each program for drawing a sample pre-plan. First, the Fire Zone product was presented to each shift on 3 consecutive days. The initial training session was geared towards opening the program, demonstrating the drawing program and its' components and printing a completed drawing.

The initial 3 day roll-out training was followed with a 3-day (one day for each shift) trial by company level crews to complete a drawing on their own.

A follow-up questionnaire was distributed to company level members that participated in the CAD drawing program training in

an effort to identify the usefulness, advantages, disadvantages and preferences of each of the products.

Assumptions

The author assumes all fire department representatives taking the survey and all company representatives (Pictometry, Fire Zone, Newcomtech.com, Lake County GIS Department and BPFDD participant in the CAD software evaluations) answered the questions honestly and correctly to the best of their abilities.

Limitations

Due to the time limitations placed on completing a comprehensive ARP, the author is limited in how much data or how many programs could be evaluated in a six-month period. Additionally, while a larger sample of other emergency service organizations would provide more data, it is understood that valuable data was produced from this ARP to provide useful information to form a decision on pre-planning documentation methods and the forms needed for a successful program.

Definitions

- CAD. Computer aided drafting or computer aided drawing programs for providing drawings, blueprints, plot plans or site plans.
- GIS. Geographical information system.
- GPS. Global positioning system.

- LIDAR. Light Detection and Ranging, a remote sensing system using a pulsed laser to measure and capture data from an aircraft.
- MABAS Mutual Aid Box Alarm System, a system used to automatically contact other fire and emergency units for use at large scale incidents needing multiple alarms and specialized equipment.
- Oblique. An angle.
- Pictometry. Photo images produced by low flying aircraft that provide an oblique (40 degree) image.
- Raster. A digital image displayed as many pixels or grid cells to create a larger image in a GIS format.
- UNIX. A computer operating system.
- Vector. One of three images, lines, polylines or polygons that can be displayed in a layered formatted GIS. Provides better images than raster data.

Results

The results of conducting a literature review, a survey, an interactive webinar, viewing demonstrations by GIS experts in their fields, viewing a GIS tutorial and an evaluation of two separate CAD programs for pre-planning revealed substantial information that can be used in a pre-incident planning program.

Additionally, a follow-up questionnaire was distributed to BPFDD participants in the software drawing evaluations.

Survey Results

An e-mail was distributed to 24 training officers to request their participation in a 10-question survey. The survey for this research was initiated prior to any further software drawing program(s) research in an effort to gain information from survey respondents on the types of software products used by other departments in the administration of their pre-plan programs.

The results of the 10-question survey (Appendix A) of other departments revealed that 12 of the 24 email recipients responded to the survey. From a department operation perspective 33.3% (4/12) represented fully paid departments, 8.3% (1/12) represented a paid on call department and 58.3% (7/12) represented combination departments for the survey.

Question two of the survey identified that 83.3% (10/12) of the respondents indicated they had a dedicated pre-plan program and 16.7% (2/12) did not.

Question three allowed for multiple answers and revealed that 72.7% (8/11) maintained pre-plans on computers in the stations, 45.5% (5/11) kept preplans on computers in emergency response vehicles, 54.5% (6/12) maintained pre-plans in a paper format in stations and 63.6% (7/11) maintained pre-plans in a

paper format in emergency response vehicles. One individual did not respond to this question.

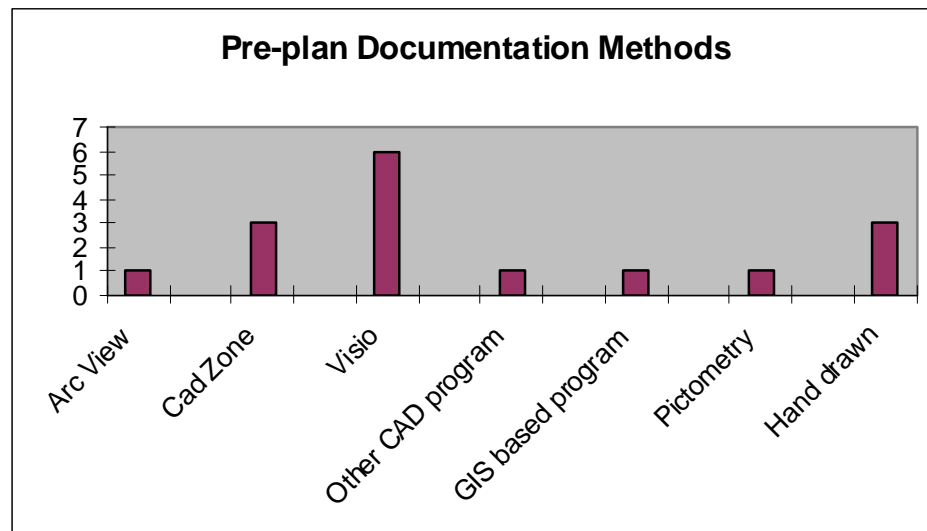
Survey question four attempted to identify the format used by company level crews when obtaining in-field surveys. A majority (54.5% or 6/11) used infield forms that are in the same format as their computer based forms, 18.2% (2/11) used a formatted form for use in the field that is different than their computer based form, 27.3% (3/11) use a different formatted form but require similar information as their computer based form and 0% (0/11) are capturing pre-plan data in the field through the use of a computer or other electronic device.

Question five of the survey was designed to identify what types of forms other departments in their pre-plan operations use. Instruction sheets (step by step directions) were used by 50% (5/10) of the respondents, pre-plan worksheets (graph paper or blank drawing sheets) were used by 60% (6/10) of the respondents, a preplan information sheet with check boxes or fill in the blanks was used by 50% (5/10) of the departments. A symbols page was used by 10% (1/10), whereas 30% or (3/10) actually had a pre-plan SOP available to crews and 40% (4/10) of the respondents identified that copies of existing plans were provided to crews prior to initiating a pre-plan. Two respondents skipped this question.

Question six identified the methods in which the departments draw their pre-plans. Twenty-five percent (3/12) state they are drawn by hand, 66.7% (8/12) identified they are drawn by computer and 8.3% (1/12) state they have an outside agency draw their pre-plans for them.

Survey question seven was designed in an attempt to identify what types of drawing programs the respondents use in their pre-plan programs. Figure 1 points out that most of the respondents use Visio (50% or 6/12), Cad Zone (25% or 3/12) or hand drawn methods (25% or 3/12) for their documentation of pre-plans.

Figure 1.



Question eight from the survey requested additional information from the respondents on their experience using other CAD drawing programs. Three individuals responded to this

question. One respondent identified that they use Microsoft Paint format, one identified the Lake County GIS departments mapping product (www.co.lake.il.us/gis/), and one uses a firehouse software based program that does not allow diagrams but does use text based documents in their pre-plan program.

Question nine elicited additional information on other software based drawing programs used by the respondents to the survey. Two individuals reported they had used Visio in the past, one had success and one identified that they felt you needed great computer skills to use the Visio program.

Two other respondents stated they had used Cad Zone in the past with very good results and very easy to use. One other respondent stated they had their engineering department create CAD drawings for them but received them in hard copies that were hard to define changes and convert to useable pre-plans.

The final question was included to identify which departments actually responded to the survey. Eleven departments responded with the name of their department and one preferred not to respond. The departments participating in the survey were: Zion, Newport, Gurnee, Lincolnshire-Riverwoods, Mundelein, Grayslake, Antioch, Lake Forest, Wauconda, Abbott and Round Lake. Table 2 represents the type of organization of 11 of the respondents. One respondent did not identify their organization.

Table 2.

Respondent Department	Type of Organization
Zion	Municipal FD
Newport	Fire Protection District
Gurnee	Municipal FD
Lincolnshire-Riverwoods	Fire Protection District
Mundelein	Municipal FD
Grayslake	Fire Protection District
Antioch	Fire Protection District
Lake Forest	Municipal FD
Wauconda	Fire Protection District
Abbott	Industrial Fire Brigade
Round Lake	Fire Protection District

Research Questions Answered

Research question 1. What computer software programs are available for drawing pre-incident plans? Research results of the 10-question survey, demonstrations, tutorial and software evaluations review reveal many different computer software programs that are available for use in a pre-incident planning program.

Cad diagramming software identified for this research include Microsofts Visio, Cad Zones Fire Zone, On-Scene

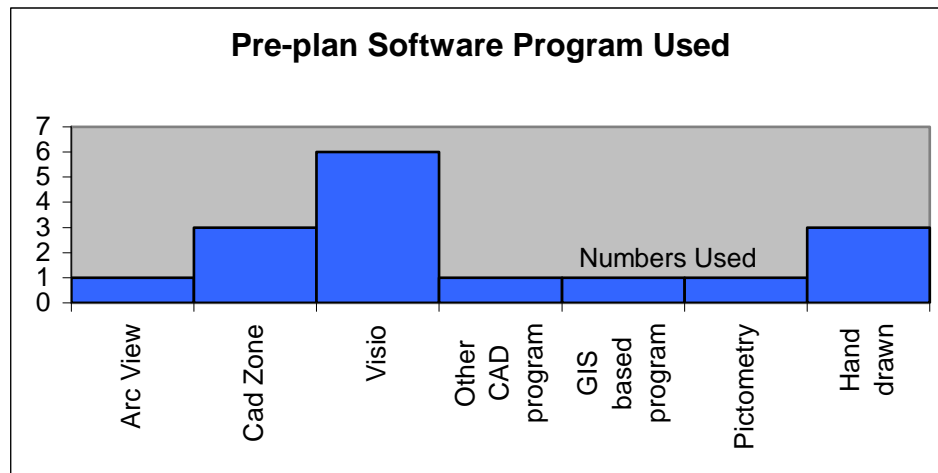
Xplorer's Iron Compass 2.6 version, Mapping Solutions (MapSol) partnership with GiveMePower to produce FIREbasePIP software and the Bode Research Groups add on graphics program Fireline are just a few of the emergency service based products on the market.

Survey questions six through eight were used to identify what programs other departments are using to produce their pre-plans. Question six asked: How are your pre-incident plans drawn? This information was requested to identify how many respondents were using computer-based programs. Eight respondents or 66.7% (8/12) identified they are using computer drawing programs to draw their pre-plans.

Of the organizations participating in the survey, the majority (50%) are using one of the Visio products by Microsoft. The next leading programs used are Cad Zones Fire Zone (25%), and the hand drawn method (25%). One response was identified for each of the Arc-View, other Cad programs, GIS based programs and Pictometry.

Figure 2 identifies the different software programs used by the respondents to the initial survey.

Figure 2. Pre-plan Software Programs Used by Survey Respondents



The Cad software evaluation also revealed two popular emergency services based drawing programs available in Microsoft Visio and Cad Zones Fire Zone products.

The Fire Zone software evaluations took place over a three-day period for each product. During November 24, 25, 26, 2008, full time 24 hour personnel and day staff personnel were provided a demonstration on the Fire Zone software drawing program. This was followed up with a three-day company led interactive training session on December 4, 5, and 6. The purpose of this procedure was for the shift members to fully activate and utilize the program from start to finished drawing.

A similar procedure was used for the Visio evaluation and on December 19, 26, and 27, 2008 the in-house full time members and

day staff personnel reviewed and utilized the Visio software product.

At least 15 members (5 on each of three shifts) participated in each drawing demonstration. Several members liked the graphics used by the CAD Zone product as they looked realistic, seemed abundant and met the NFPA 170 standard for symbols. Some individuals struggled to use the point and click drawing program. Two individuals that were familiar with CAD programs excelled at using the Fire Zone software.

Fire Zone had the symbols that Visio did not. One drawing completed by company members in the Visio program had an orange hydrant in place for the fire department connection (FDC) as no symbol could be found that represented a FDC or other similar valve. Several members easily used the Visio format to complete sample drawings after initial demonstrations. It was identified that the drag and drop windows based method was more familiar to those completing the drawings.

Others reported that there was substantial time to search and find compatible symbols in the Visio format whereas the Fire Zone symbols could be found more rapidly with a larger selection to choose from.

During the GIS demonstrations by both the representatives of NewComTech.com and the Lake County GIS department it was

revealed that through the use of GIS data, building outlines can be duplicated from the orthogonal view, copied and the outline placed in another drawing, word or jpeg format. This provides an outline drawing of the building that can then be used as a beginning pre-incident plan outline. Each of the company representatives demonstrated this procedure for the author.

NewComTech.com also provides data conversion from many different industry CAD platforms using Safe Software's feature to convert files to useable pre-incident and GIS plans.

Research question 2. What geographical information systems are available for use in a pre-incident planning program?

There are several GIS programs on the market, but the research indicates that ESRI's Arc line (Arc-View, Arc Editor, Arc Info) of products is the leader in the GIS industry. Survey question seven indicated that 8.3% (1/12) of the respondents utilized Arc-View, and 8.3% (1/12) used another GIS based system in their pre-incident planning program.

Two separate organizations were contacted to obtain research data on GIS programs for this project. Newcomtech.com and the Lake County GIS Department provided information and expertise on GIS systems that are currently being used by their organizations.

Newcomtech.com representatives. Mr. Jeff Doty (Vice President of Market Development) and Mr. Jim Petro (President) attended a joint meeting on October 7, 2008 at the BPFDD.

The demonstration provided an example of how a GIS can be used for mapping and pre-planning purposes. Mr. Doty identified that 85% of the products used for GIS in government applications are based on the world leading ESRI Arc-View platform (J. Doty, personal communications, October 7, 2008).

The demonstration utilized an Arc-View GIS platform that allowed the layering of different grouped items into a map on a screen. The layers used were; water supply with hydrants and feeder lines, roads and intersections, buildings and structures. Additional layers were available but not used for the demonstrations.

Layers could be turned on or off as needed. One interesting feature is that parcel addresses could be added as a layer and buildings were coded by color. Residential building were highlighted in yellow, target hazards in red and industrial buildings in blue. The demonstration allowed the ability to rapidly identify the different structures and layers of the map/pre-plans as needed.

During the presentation, Mr. Doty and Mr. Petro were asked the following questions; (a) What products do you have that

would be useful to an emergency service agency for preplanning activities, (b) What format does your product use for pre-planning information, (c) what is the learning curve for your product and GIS applications, and (d) what is the cost of your product.

NewComTech.com markets several products including the Voyager Suite of Voyager-EMP (Emergency Management Pack) for use in damage assessment, Voyager-Commercial Building Inspections, Voyager-Command and Control for commercial pre-plans and the See City Suite.

The Voyager-Durable Mobile Inspection feature allows an individual to gather and enter field data on a tablet type computer in addition to viewing a full complement of forms, policies and past violations of a business or structure. A tremendous feature of the product is that it allows the integration of a wireless hardened digital camera to take photos and categorize them with the specific business or structure for future referencing of hazards or violations. This feature also allows pictures to be taken inside a structure and have them sent virtually immediately to a tablet or computer outside the structure or in some other mobile vehicle.

The See City Suite offers the ability to manage work duties from a desktop computer. Changes can be made quickly in their

GIS program such as changing zoning boundaries, parcel notification, manage parcel information, manage infrastructure, create and retrieve pre-plans and document telecommunications work in your dedicated GIS program. (J. Doty, personal communications, October 7, 2008).

NewComTech.com offers the base product GIS (Arc-View) for \$1200.00 with the cost of an annual upgrade at \$400.00. This provides for a one-seat (one individual computer) license that includes maintenance upgrades. The NewCom desktop solutions software with first year support is \$6,000.00, the hardened camera is priced at \$800.00 and the computer and docking station for the product including wireless features and components total approximately \$17,000.00 (J. Doty, personal communications, October 7, 2008).

When asked how often maps are upgraded for these programs, it was identified that it depends on your local or regional county upgrades as maps for the various GIS programs would be based on the county upgrades (J. Petro, personal communications, October 7, 2008).

The learning curve for use of a GIS program was identified as one that would be expected with any other computer based software program. At first it would take some time, but anyone with computer knowledge and the ability to navigate through a

windows program should have a pretty good handle on it within a day of working with it (J. Doty, personal communications, October 7, 2008).

An interview and interactive demonstration of the Lake County, IL GIS Department occurred on October 28, 2008. Present for this informational session were Keith Caldwell, GIS Analyst Supervisor and Peter Schoenfield, Principal GIS Analyst. The questions to be answered during this session were; (a) what are other fire departments using GIS data for in our county, (b) what software would be required to use the data available through the Lake County GIS department, (c) what is the learning curve for using Arc-View, (d) what type of training would be available to use the products that our county uses.

The Lake County GIS department also uses the ESRI Arc-View platform for their maps and programs. A demonstration was performed using the BPFDD district boundary outlines and specific structures that included buildings, roads and infrastructure. A mapping/pre-plan example was initiated that included different GIS layers with roads, structures, public infrastructure and parks, private infrastructure and residential homes, and water systems both with hydrants and static water supplies.

In an effort to identify what pre-planning aspects of a GIS program could be used by the BPFDD, Keith Caldwell outlined the

BPFD fire district boundaries, selected different layers to be placed on a map (water system, roads, structures) selected two individual properties one residential and one owned by the county for this demonstration. Each property was placed on a separate layer so they could be viewed individually or together on the same map. An example was provided of a long driveway, not easily seen from the road and the length of the drive was measured, using the software provided, from the road to the structure. This feature alone has positive implications in regards to pre-planning occupancies in any governmental organization.

Another example was provided in an effort to use existing data for reference in a map book. Mr. Caldwell highlighted an area on the map, placed an entry in the GIS program that created a layer for addresses and a map page was created with addresses attached to each structure. This feature would help eliminate passing by addresses when responding to emergencies.

It was identified that additional features could be added as layers including parks, bike paths, ponds, lakes and streams, parcel lines, lot lines, hazardous occupancies, addresses and city parcel data, aerial photos, text documents and most other features that someone would like to document on a map. An example was provided of a thematic layer that can be created

that only includes individuals that have the senior housing exemptions on their residences thereby identifying an at risk population (elderly or over 55) in your community (K. Caldwell, personal communications, October 28, 2008).

Mr. Caldwell identified that currently aerial photography is updated annually in Lake County, but the department updates their maps, roads and other data layers each week.

The cost for the Arc-Info program that coincides with the Lake County GIS Program would be approximately \$1500.00 initially and Lake County would provide the geographical data to the BPFDD through an already established memorandum of understanding (MOU). The learning curve and costs associated with a GIS product would include a two-day regional hands-on training class at a cost of approximately \$1000.00 plus the employees' salary for the two days. This could get someone up and ready quickly so they could effectively use the GIS program. The feeling was that it would be unlikely for someone with computer experience, but no GIS experience to get started and effectively utilize the product without a higher than normal frustration level and an extended learning curve (K. Caldwell, personal communications, October 28, 2008).

Private organizations that are approved ESRI training centers provide local and regional seminars throughout the

country. Additionally, free web based training is offered on line throughout the year on different GIS subjects (K. Caldwell, personal communications, October 28, 2008).

Other fire departments in Lake County, IL are using GIS for creating map books and pre-incident planning documents. A copy of the Deerfield-Bannockburn Fire Protection Districts' map book with pre-planned occupancies was provided for viewing. This was a professional document that identified roads, intersections, hydrants, static water supplies and structures. The structures were outlined in color to depict a specific type of building and locations were marked for entrances, key boxes and utilities. Six separate fire departments in Lake County, IL were identified as GIS leaders and the contact person for each one was supplied for additional research information (K. Caldwell, personal communications, October 28, 2008).

An interactive webinar (internet web seminar) demonstration was also implemented for this research. On October 17, 2008 Mr. Jeremiah McGrath from pictometry.com provided an interactive demonstration on their products benefits and uses. Seven BPFDD members were present for the interactive demonstration. The questions that were asked included; (a) what pre-plan applications are available for fire and emergency service agencies, (b) what are the benefits of Pictometry, (c) where

could pre-plan documents be saved, (d) how often are the images updated, (e) what is the cost of implementing or using pictometry.

Mr. McGrath provided two examples of how pictometry can be used. One was in a law enforcement setting and another was in a wildland interface setting.

Pictometry can be used for documenting pre-plans, viewing surrounding areas or for post incident critiques (J. McGrath, personal communications, October 17, 2008).

The wildland interface example provided a birds eye view of a neighborhood at a slight angle (40 degrees) as compared to an orthogonal view that would be seen from a satellite image. The image identified other neighboring properties, water sources including hydrants and static sources in addition to wildland interface areas. Mr. McGrath highlighted specific buildings and the wildland interface area each in a separate opaque color. This was identified to specify the areas in question without totally darkening the area with color so it would still be visible on screen.

The benefits of pictometry is that it allows you to view the different sides of a building from an elevated area while still being able to perform precise measurements with 99% accuracy (J. McGrath, personal communications, October 17, 2008). Measuring a

fence line, wall height of a building, the length and width of a building structure to get total square footage, and the rise and pitch of a roof line completed an example (J. McGrath, personal communications, October 17, 2008).

Another example was implemented using a building in the BPFDD district. An outline of a hotel occupancy was copied from the birds eye view and specific items of interest were placed on the diagram that included key box, main egress areas, fire department connections and utility locations. An oblique view (40 to 45 degrees) of the premise with items of interest was completed.

Other items of interest that are available by using pictometry are United States Geological Survey elevation data, precise measurements in square footage, wall height, angle and pitch measurements and city or county parcel information in some regions of the country. Furthermore, approximately 80% of the populated United States has been flown and images are updated approximately every two years unless the county or regional government pays to have updated imagery more frequently (J. McGrath, personal communications, October 17, 2008).

Pre-incident planning documents are saved on Pictometry's server and access is granted with a user name and password. Images and pre-plans can be downloaded and printed for hard copy

use. In field applications require a satellite, broadband access or a wireless Internet connection (J. McGrath, personal communications, October 17, 2008).

Typically the cost to obtain the images by a county or regional government can run as high as \$40,000 to \$70,000 to provide aerial images of an entire county or region. Usually this cost is borne by the county or regional government and Lake County, IL already has imagery using the proprietary pictometry process (J. McGrath, personal communications, October 17, 2008).

Subscriptions for Pictometry's use is based on the number of users assigned to a specific area. One user would incur a cost of \$80.00 per month (\$960.00/Yr), two users would incur a single user fee and a cost of \$36.00 per month (\$432.00/Yr) for the second user for a total yearly fee of \$1392.00. Three users would incur the first two user fees and the third user would incur a reduced fee for a total yearly fee of \$1800.00. The sliding scale continues up to a total of 5 users for an annual fee of \$2600.00 per year plus the cost of the imagery. Imagery cost is determined by how much of the individual county's aerial images have been previously obtained. Governmental agencies can work together in one county to split the costs of a multiple user fee thereby providing savings to each organization (J. McGrath, personal communications, October 17, 2008).

The USFA GIS tutorial revealed many public and private sources for GIS data that includes the United States Geological Survey, FEMA, USFA, Natural Hazards Center, U.S. Census Bureau, ESRI, MapInfo and various universities and colleges.

The USFA tutorial offered a basic hands on interactive demonstration based on ESRI's Arc-Explorer platform. The program demonstrated how to zoom in or out, how to change the way data is displayed, identified how to label features on a map and gave examples of how to create thematic map layers using the program.

Research question 3. What paper forms are needed for documentation of pre-incident plans? Survey questions three through five were used to answer what formats other departments keep their pre-plan documents in. Survey question 3 identified the formatting that other department use for documenting pre-incident plans. Most of the departments surveyed have pre-plans on computers in the station (72.7% or 8/11), on computers in emergency response vehicles (45.5% or 5/11), in a paper format in station binders (54.5% or 6/11) and paper format in emergency response vehicles 63.8% or (7/11). It is clear that many departments use multiple formats for maintaining pre-incident plans. One individual did not respond to this question.

Survey question 4 attempted to illicit the informational forms that are used to obtain in-field data by emergency crews.

The information reveals that 54.5% (6/11) use the same formatted form as their computer generated forms, 18.2% (2/11) use different in-field forms than their computer forms, 27.3% (3/11) use different formatted forms than their computer generated forms but still require similar data and 0% (0/11) are capturing the in-field data using a computer or other electronic device.

Survey question 5 allowed the respondents to mark multiple categories and the results revealed that 50% (5/10) have a pre-plans instruction sheet for crews to use, 60% (6/10) supply a pre-plan worksheet or graph paper for drawing building layouts, 50% (5/10) utilize a check box or fill-in-the blank sheet for crews to complete. Only one department (10% or 1/10) provided a symbols page for crews, 30% or (3/10) have an SOP on pre-planning operations and 40% (4/10) supply existing copies of pre-plan data to in-field crews prior to conducting a pre-plan. Two individuals did not respond to this question.

Fire Zones First Look Pro provides a text document in a printable screen that is also supplied in a matching electronic format. The Kingsville Fire Department utilizes an inspectional form in a First Look Pro format that includes occupant, structure, building access, hydrant, protection features, hazmat features, strategy and contact information on one form in multiple pages.

Several other pre-plan forms were downloaded for review. The Kingsville, Ontario, Canada Fire Department, Tempe, AZ Fire Department, Mercer County, KY Fire Department, and the Delta, British Columbia, CA Fire Department pre-incident planning forms were used for this research. Additionally, the IAFF hazardous material pre-incident planning form (Module 4 haz mat training materials) and the Aiken County, SC Hazmat Teams pre-plan forms were downloaded for review. (See Appendix B for links to forms).

General information included in all preplan forms were occupant/owner information, building access information, construction features, building dimensions, key box locations, sprinklers, risers and fire department connections, hydrant locations, utility locations, special hazard information and exposure information.

The hazardous materials pre-plan forms added special hazard information, procedures to be used in the event of a major spill, target hazards to be protected and information on flammable liquids, pressurized cylinders and bulk chemical storage.

The Mercer County Fire Department supplied a piece of graph paper with their pre-plan forms and the IAFF form specified the attachment of an 8 ½" x 11" site plan is required.

The results of this research have established the need to create the paper forms to effectively operate a fledgling pre-incident planning program. See Appendix C for the forms that were produced from this research. A fill in the blank pre-plan data worksheet, site plan worksheet, pre-incident planning instruction page, symbols page and a blank sheet of graph paper will be supplied as a hard copy and in an electronic format to BPFDD companies initiating in-district pre-incident plans.

Discussion

The literature review and research for this report identified several different programs for use in pre-incident planning programs. Pictometry, GIS and CAD diagramming software programs were identified along with some of their characteristics, advantages, disadvantages and intended uses. Additional software programs were identified as add-on enhancements to existing drawing programs on the market.

Although Pictometry was not specifically identified as a traditional GIS program, it offers many of the benefits of a GIS in addition to other enhanced features. Pictometry is a highly accurate photo image produced by low flying aircraft using LIDAR technology to produce oblique angle (40-45 degrees) photo images (Pictometry.com, 2008a; J. McGrath, personal communications, October 17, 2008). The oblique angle is different from an

orthogonal or straight down satellite view of buildings and land structures (Indiana University, 2008).

The difference in Pictometry and a traditional GIS is that Pictometry offers several elevated views of each side of a structure which can be viewed with a click of a mouse in addition to precise measurements of building heights and roof angles (J. McGrath, personal communications, October 17, 2008). Another difference is that Pictometry's images are captured by an aircraft and GIS images are captured via satellites (Wikipedia.org, 2008b).

A distinct similarity of Pictometry and GIS programs used for this research is that each program (Pictometry and Arc-Info) allows the individual user to measure distances including fences, building structure dimensions and other features. PIC's product is also compatible with the Arc-GIS viewer available in most GIS systems. This tool is useful to fire departments when measuring distances to water sources, roads or remote structures (J. McGrath, personal communications, October 17, 2008; K. Caldwell, personal communications, October 28, 2008).

The Environmental Systems Research Institute or ESRI is the world leader in GIS applications and uses for storing, analyzing and manipulating geographic data. ESRI has products for use in desktop, mobile and specialized applications (Environmental

Systems Research Institute, 2008a; K. Caldwell, personal communications, October 28, 2008; J. Doty, personal communications, October 7, 2008).

The United States Fire Administrations lists ESRI as a leading GIS software product and their GIS tutorial (CD) runs on an ESRI platform (USFA, 2003). ESRI offers 3 main products from their Arc-line that includes Arc-View, Arc Editor and Arc Info (ESRI, 2002). Each product of the Arc-line offers additional features based on an individual organizations needs. Newcomtech (2008) also runs their suite of product on the ESRI Arc-View product line (J. Doty, personal communications, October 7, 2008).

The GIS demonstrations from the Newcomtech representatives and the Lake County, IL GIS Department provided substantial information on how GIS systems are used. Both systems were based on ESRI's Arc-line of products and each could produce thematic layers chosen by the individual making the map. Both demonstrations provided examples that could be used to create individual pre-incident plans or traditional map pages with roads, intersections and building structures (K. Caldwell, personal communications, October 28, 2008; J. Doty, personal communications, October 7, 2008).

During each demonstration at least 3 thematic layers were produced that included water supply, roads and building structures. Additional layers were added to the demonstration maps to indicate their uses, identify specific properties or to indicate special features like parks, bodies of water or special features (K. Caldwell, personal communications, October 28, 2008; J. Doty, personal communications, October 7, 2008).

One interesting feature presented was that a thematic layer could be produced based on a tax exemption status. This would allow a fire department to identify a special section of the population (elderly or over 55) for inclusion on a map layer (K. Caldwell, personal communications, October 28, 2008).

GIS systems have been in use in the fire service for many years in the wildland setting. A project in Montana has used GIS to map hydrants, static water sources, water flow calculations, roads, bridges, land use, slope and hazards (Close, 1993). One interesting feature that is available to the fire service is an integrated GPS and GIS system for use with digital radios.

Patterson, (2007) identified the use of integrated GPS and GIS technology where crews with radios and handheld GPS devices can scout and provide coordinates of fire progression, hazards and other important features by communicating through their

radios. The information and coordinates are then transferred to a GIS and then to a thematic layer.

While a GIS provides many important features for use in mapping and pre-planning operations, CAD diagramming software offers the ability to provide precise information to crews prior to an emergency. There are many different CAD drawing programs available on the market including Fire Zones Cad Zone, Microsoft's Visio, On-Scene Xplorers 2.5 and 2.6 mapping and pre-planning software, Mapping Solutions FIREbasePIP and others.

The research indicates that most fire departments are using Visio, Fire Zones Cad Zone or hand drawn methods for producing pre-incident plans. Twenty four departments were surveyed for this research and twelve responded to the on-line survey. Although most departments are pre-planning hazards in their fire districts, the research identifies that there are multiple methods being used by departments to document their pre-plans. Fully paid (33.3%), paid on call (8.3%) and combination (58.3%) departments made up the survey respondents.

While departments carried their pre-incident plans in varying forms including on computers, in binders, in the emergency apparatus and in the station, the real value is that pre-incident plans are available to emergency responders.

The large majority of respondents (66.7%) identified that their pre-plans are drawn by computer while a quarter (25%) draw them by hand and even less (8.3%) have them drawn by an outside agency.

This research was primarily designed to identify different GIS and CAD software programs that are in use by other departments. It is evident that Visio is used by a majority (50%) of departments, Fire Zones Cad Zone (25%) is the next most popular drawing program and then the hand drawn method (25%) was used. Some of the departments surveyed also use Arc-View, other CAD programs, GIS based programs and Pictometry in the manufacture of their pre-incident plans.

The results indicated that the Cad Zone product is a typical CAD program that used a point and click method to produce walls, dimensions and other features. Visio on the other hand utilizes Microsoft's window based drawing format where the drawing is completed through a series of drag and drop procedures for walls, dimensions and other components.

The research allowed the opportunity for each shift to be trained on each product (CAD Zone then Visio) for 3 consecutive days followed by the opportunity to use each product on a separate training day. There were differing comments on each of the products. One firefighter had extensive experience with CAD

drawing programs and found the CAD Zone product the most useful. Several other individuals found the Visio product more user-friendly and compatible to what they were accustomed to using. This was not a huge surprise as most people are familiar with window based programs that are used throughout the world on a daily basis (see Appendix D for BPFQ questionnaire results).

The direct and indirect costs associated with the different products varied. Pictometry's product had a sliding scale for purchase and use in addition to the cost of purchasing imagery. Costs for regional or county imagery range from \$40,000 to \$70,000 in addition to approximately \$2600.00 for access to Pictometry's product (J. McGrath, personal communications, October 17, 2008).

GIS products utilizing ESRI's Arc-line would initially cost \$1500.00 for Arc-Info through the Illinois State purchasing agreement with governmental bodies. Additional costs that would be incurred are \$1,000.00 for a 2-day training session per person and salary costs for each employee (K. Caldwell, personal communications, October 28, 2008).

Newcomtech.com offered their base GIS Arc-view product for an initial cost of \$1200.00 and \$400.00 for an annual upgrade. Other products offered include the Voyager-EMP (emergency management pack), command and control, mobile inspection feature

and the See City Suite. The top of the line product with hardened camera, hardware, software and docking station can run as high as \$17,000 (J. Doty, personal communications, October 7, 2008).

There was a discrepancy in the response to the question of what the learning curve would be for the use of a GIS product like Arc-Info or the Newcomtec.com product. The Newcomtech.com representatives indicated that their product would take some time to learn, but anyone with computer knowledge and the ability to navigate a windows based program would have a good handle on it after a day of use (J. Doty, personal communications, October 7, 2008).

The Lake County, IL GIS Department representatives indicated that learning the Arc-Info product would require extensive time by yourself and highly recommended one of the private, ESRI approved organizations that offer local or regional training seminars on the Arc-Info product. The feeling was that a 2-day seminar would be sufficient to get started at the cost of approximately \$1,000 per employee plus salary costs (K. Caldwell, personal communications, October 28, 2008).

Fire Zones Cad Zone and First Look Pro Products were slightly more reasonable for implementing a pre-incident planning program. The Cad Zone Drawing product is \$399.00 for

the 2D program and \$699.00 for the 2D/3D program. The First Look Pro product that is utilized for categorizing pre-incident planning forms is available for \$399.00 for the 4.0 basic version and \$899.00 for the upgraded version combined with the mobile mapping feature.

Microsoft Visio was even more economical at \$559.00 for the professional version and \$349 for the upgrade to professional from standard. The standard Visio price, which would be sufficient to produce professional looking drawings, is \$259.00 (Microsoft, 2008b).

Add-on components are available through other software vendors including the Bode Research Groups Fireline product. BRG's Fireline product offers enhanced graphics, shapes and images for use in pre-plans, mapping and critiques. The cost of the add-on graphics program is \$129.00 (Bode Research Group, 2004a). This option is inherently interesting as compared to the others as the BPFDD already has 2 Visio licenses and the program is installed on 2 desktop computers in the station.

While the costs involved with using a GIS based system are substantially greater than using a CAD based system, there are many benefits provided by both. GIS based systems will take longer to establish and train employees to use in addition to being more costly, whereas both the CAD and windows based

programs were utilized fairly quickly and appeared to be user friendly by most employees.

The literature review and the research revealed that documentation procedures and processes are important to implementing and coordinating a successful pre-incident planning program. Fire Zones First Look Pro offers an electronic form that can be printed and used for obtaining on scene information during pre-plan operations (Cad Zone, 2008; Kingsville Fire Department, 2006).

Several pre-incident planning forms were obtained from other fire departments for review during this research. The Tempe, AZ Fire Department (TFD), (2008) supplies a packet of information to prospective builders in an effort to obtain information for preplans. The TFD recommends a DWG or AutoCAD format and requires a scaled drawing, street locations, hydrants, fire panel, fire department connections and risers and roof access point for fire personnel.

The Mercer County, Kentucky Fire Department (2006) uses a combination building inspection and pre-plan form in their pre-plan program and the Delta Fire and Emergency Service Department in British Columbia, Canada provides a guideline information sheet, a Visio template and pre-plan flow sheet to companies

collecting information on buildings and occupancies in their district (Delta Fire & Emergency Services, 2004).

Much of the information requested on these pre-incident planning forms includes information on occupancy, structure, building access, water supply, hazardous materials, strategies, fire protection, alarm devices, emergency contact information, construction type and egress points.

Recommendations

A few recommendations come from this research project. The primary recommendation identified through this research is for the Beach Park Fire Department administration team to establish the budget availability, time limitations and direction that will be used in determining the specific product(s) for use in pre-planning occupancies within the district.

The primary recommendation to come out of this research that should be immediately established is the full use of the hard copy and electronic copies of forms that were produced from this research. Paper copies of the fill in the blank pre-plan data worksheet, site plan worksheet, pre-incident planning instruction page, symbols page and a blank sheet of graph paper shall be provided to all employees prior to initiating department pre-plans. Additionally, electronic copies shall be

provided on the department server and computer common drives for access by all employees.

One recommendation is to utilize the current Visio 2007 drawing product already installed on BPFDD computers in addition to training a minimum of three employees (1 per shift) in the specific pre-plan drawing format to be used by the department.

The second recommendation is to acquire more information, or a trial copy of the Bode Research Groups FireLine graphics program to identify the products compatibility and symbols that are available for use with the current Visio program. The cost of the FireLine add-on product is \$129.00. The FireLine graphics program needs to be researched prior to making a decision on which CAD based program (Fire Zone or Visio) should be used for documenting pre-incident drawings.

Another recommendation is to download ESRI's free Arc-Explorer or Arc-Reader program to provide a better understanding of the product and its uses. This download may assist with the current mapping program in addition to providing potential benefits in the future towards the pre-incident planning program. Combined with this download, contact should be made with the Lake County GIS Department for access and information to their maps and mapping systems for use by the BPFDD.

References

- Allen, L. (28). *Outside the boxes: The importance of good documentation*. Retrieved October 2, 2008, from <http://www.emsresponder.com/features/article.jsp?id=8152&siteSection=22>
- Berry, T. (2008). *Pre-Incident planning must go to the head of the class for nation's schools*. Retrieved August 31, 2008, from http://www.respondersafetyonline.com/Classes/Articles/ArticleDraw_P.aspx
- Blom ASA. (2008). *Navigation*. Retrieved September 12, 2008, from <http://www.blompictometry.com/intro.html>
- Bode Research Group. (2004a). *BRG precision products*. Retrieved November 7, 2008, from <http://www.brgproducts.com/page5.html>
- Bode Research Group. (2004b). *Flawless fire service graphics*. Retrieved November 7, 2008, from <http://www.brgproducts.com/download/VISIOBR1.pdf>
- Cad Zone. (2008). *"Critical pre-fire planning now an easier task for military bases,"*. Retrieved August 31, 2008, from http://www.cadzone.com/articles/article_al_lohner_military.htm

City Of Portland, OR. (2008). *How GIS works*. Retrieved August 31, 2008, from <http://www.portlandonline.com/omf/index.cfm?a=13121&c=28138>

Close, K. R. (1993). Fighting fire with computers-GIS pre-plans the wildland/urban interface. *American Fire Journal*, 45(10), 20-25.

Delta Fire & Emergency Services. (2004). *Pre-Plan guidelines*. Retrieved October 22, 2008, from <http://www.deltafire.ca/Forms.htm>

Environmental Systems Research Institute (2002, September). *Geography matters: An ESRI white paper*. Redlands, CA: ESRI.

Environmental Systems Research Institute. (2008a). *What is GIS?* Retrieved October 23, 2008, from Environmental Systems Research Institute Web Site: <http://www.gis.com/whatisgis/index.html>

Environmental Systems Research Institute. (2008b). *Desktop GIS*. Retrieved October 23, 2008, from <http://www.esri.com/products/index.html>

Environmental Systems Research Institute. (2008c). *ArcView-desktop GIS for mapping, data integration, and analysis*. Retrieved October 28, 2008, from <http://esri.com/software/arcgis/arcvview/about/features/html>

Environmental Systems Research Institute. (2008d). *ArcEditor: Multiuser editing and advanced analysis*. Retrieved October 28, 2008, from <http://esri.com/software/arcgis/arceditor/index.html>

Environmental Systems Research Institute. (2008e). *ArcInfo: The complete desktop*. Retrieved October 28, 2008, from <http://esri.com/software%20 /arcgis/arcinfo/index.html>

Federal Emergency Management Agency (FEMA) (2ndEd.). (2007). *Executive analysis of fire service operations in emergency management* (2nd ed.). Emmitsburg, MD: Author.

Franklin Regional Council Of Government (FRCOG). (2006). *Geographic Information Systems (GIS): Pictometry, Project Overview*. Retrieved September 12, 2008, from http://www.frcog.org/services/gis/gis_pictometry.php

Find Articles.Com. (2008). *Fire departments around the country select emergency response software from mapping solutions and GiveMePower*. Retrieved August 31, 2008, from http://findarticles.com/p/articles/mi_m0EIN/is_2004?April_27/ai_n6000557

Gaynor, A. K. (1998). *Analyzing problems in schools and school systems*. Mahwah, NJ: Lawrence Erlbaum Associates. Retrieved October 2, 2008, from <http://www.questiaschool.com/read/13647752>

- Genesee County. (n.d.). Pictometry. Retrieved September 12, 2008, from <http://www.geneseecounty911.org/pictometry.htm>
- GIS Lounge. (2008, May). *What is GIS?* Retrieved August 31, 2008, from <http://gislounge.com/what-is-gis/>
- Google. (2008). *Google Maps*. Retrieved October 28, 2008, from <http://maps.google.com/>
- Group 1 Solutions, Inc. (2008). *Featured capabilities* [Brochure]. Glen Ellyn, IL: Author.
- Howard, P. S. (2008). *Defining a pre-Incident planning program as a component of a risk reduction plan*. Emmitsburg, MD: National Fire Academy.
- Indiana University. (2008). *At IU, what pictometry datasets are available?* Retrieved September 12, 2008, from <http://kb.iu.edu/data/aqku.html>
- International Association of Fire Fighters. (n.d.). *Module 4: Pre-Incident planning*. Retrieved November 11, 2008, from <http://www.iaff.org/et/HW/PDF/Tech%20Module%2004%20Student%20Text.pdf>
- Kingsville Fire Department. (2006). *Pre-plan form*. Retrieved November 11, 2008, from http://www.kingsvillefire.ca/Pre-plan_Form.pdf

Lake County Fire Chiefs Association (2008). *Lake and Mchenry Counties Specialized Response Teams: MABAS Divisions 4 & 5.*

Retrieved October 2, 2008, from

<http://www.lakecountyfirechiefs.org/>

Lidar Services. (2001). *Lidar = Light detection and ranging.*

Retrieved October 29, 2008, from

<http://www.lidar.co.uk/technical.htm>

Louisiana Geographic Information Systems Council. (2008). *How*

does GIS work. Retrieved August 31, 2008, from

<http://lagic.lsu.edu/gisprimer/whatsgis.asp?topic=howitworks>

Mapping Solutions Incorporated. (2008a). *Mobile mapping*

software. Retrieved November 7, 2008, from

<http://www.mapsol.com/Fire/FIREbaseMAP.html>

Mapping Solutions Incorporated. (2008b). *Pre-Incident planning*

software. Retrieved November 7, 2008, from

<http://www.mapsol.com/Fire/FIREbasePIP.html>

Mapquest. (2008). *Maps & directions.* Retrieved October 28, 2008,

from <http://www.mapquest.com/beta>

Massachusetts Office of Geographic and Environmental

Information. (2007). *Municipal GIS resources.* Retrieved

August 31, 2008, <http://www.mass.gov/mgis/munigis.htm>

Mercer County Fire Department. (2006). *Building inspection & pre-plan form*. Retrieved August 31, 2008, from <http://mercercountyfire.com/forms/MCFPD%20Building%20Preplan%20Form.pdf>

Microsoft. (2008a). *Office visio 2007*. Retrieved November 7, 2008, from <http://office.microsoft.com/en-us/visioFX102464421033.aspx>

Microsoft. (2008b). *Two editions*. Retrieved November 7, 2008, from <http://office.microsoft.com/training/training.aspx?AssetID=RP011267541033&CTT=6&Origin=RP011267431033>

Newcomtech. (2008). *Voyager-EMP (Emergency Management Package)*. Retrieved October 14, 2008, from http://newcomtech.com/industries/emergency_management/ems.htm

North Aurora Fire Protection District. (2007). *Public preplan*. Retrieved November 11, 2008, from <http://www.nafd.org/preplan.htm>

On-Scene Xplorer. (2008a). *On-Scene Xplorer*. Retrieved November 7, 2008, from http://www.onscenexplorer.com/?page_id=60

On-Scene Xplorer. (2008b). *On-Scene Xplorer: Introduction*. Retrieved August 31, 2008, from http://www.onsceneexplorer.com/?page_id=14

Patterson, T. (2007). Mapping our progress: How GIS is changing fireline tactical decisions. *Wildland Firefighter*, 9, 24-27.

Pictometry.Com. (2008a). *Pictometry: LIDAR data*. Retrieved September 2, 2008, from <http://www.pictometry.com/government/lidar.shtml>

Pictometry.Com. (2008b). *Government, assessor technology*. Retrieved September 2, 2008, from <http://www.pictometry.com/government/3d.shtml>

Pictometry.Com. (2008c). *Curbside imaging*. Retrieved September 12, 2008, from <http://www.pictometry.com/government/curbside.shtml>

Realview LLC. (2007). *Send them in with everything they need*. Retrieved November 11, 2008, from http://www.realviewllc.com/pdf/fire_pages.pdf

Tempe Fire Department. (2008). *Pre-Plan new construction application package contents*. Retrieved November 11, 2008, from <http://www.tempe.gov/fire/FirePrevention/01-04%20Pre-Plan%20New%20Construction%20Package.doc>

United States Fire Administration. (2003). *Geographic information system tutorial: Demonstrating the use of GIS technology for the fire service with NFIRS data* [CD].

Emmitsburg, MD: Author

United States Fire Administration (2005). *Executive fire officer program: Operational policies and procedures*. Emmitsburg, MD: Author.

United States Geological Survey. (2008). *Geographic information systems*. Retrieved August 31, 2008, from http://erg.usgs.gov/ish/pubs/gis_poster/

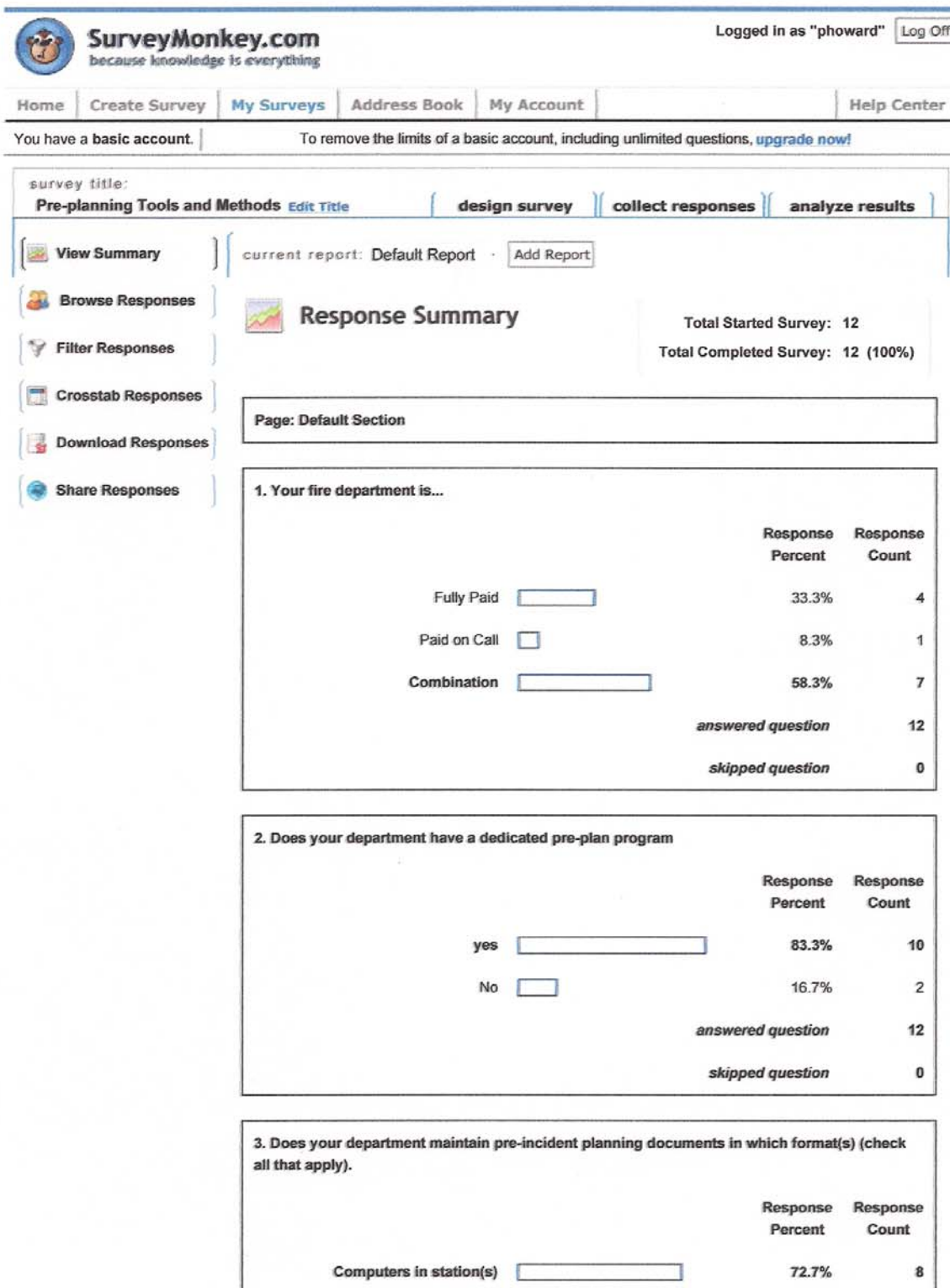
Wikipedia.Org. (2008a). *Pictometry*. Retrieved October 23, 2008, from <http://en.wikipedia.org/wiki/pictometry>

Wikipedia.Org. (2008b). *Geographic information system*. Retrieved October 23, 2008, from http://en.wikipedia.org/wiki/Geographic_information_system

ired: Blog Network. (2008). *Consumers crave multimedia on navigation devices*. Retrieved October 23, 2008, from <http://blog.wired.com/gadgets/2008/09/consumers-crave.html>

Yahoo . (n.d.). *Get map and directions*. Retrieved October 28, 2008, from <http://maps.yahoo.com/>

Appendix A



Computers in emergency response vehicles	<input type="text"/>	45.5%	5
Paper format in binders in stations	<input type="text"/>	54.5%	6
Paper format in emergency response vehicles	<input type="text"/>	63.6%	7
answered question			11
skipped question			1

4. The forms that emergency crews use to obtain the data during a field survey (pre-plan)...

		Response Percent	Response Count
Are in the same format as the computer generated forms.	<input type="text"/>	54.5%	6
Are different than the computer generated forms.	<input type="text"/>	18.2%	2
Are different than the computer generated forms but require similar data.	<input type="text"/>	27.3%	3
Are electronically captured in the field (by computer or other device)		0.0%	0
answered question			11
skipped question			1

5. The forms that are used in your pre-incident planning program include (mark all that apply).

		Response Percent	Response Count
A pre-plan instruction(s) sheet (a step by step procedure for crews to conduct a pre-plan).	<input type="text"/>	50.0%	5
A pre-plan worksheet (Graph or blank paper) for drawing the building layout.	<input type="text"/>	60.0%	6
A pre-plan information sheet that includes check boxes or fill-in-blanks for location information, construction type, alarm systems, utility locations, etc	<input type="text"/>	50.0%	5
A symbols page	<input type="text"/>	10.0%	1
A Standard operating procedure			

(SOP) on Pre-incident planning.	<input type="checkbox"/>	30.0%	3
Copies of existing pre-plans are provided to crews prior to conducting a pre-plan survey.	<input type="checkbox"/>	40.0%	4
answered question			10
skipped question			2

6. How are your pre-incident plans drawn?

		Response Percent	Response Count
By hand (drafting board)	<input type="checkbox"/>	25.0%	3
By computer	<input type="checkbox"/>	66.7%	8
By an outside source or other entity (private company, village engineering dept, building dept, or other).	<input type="checkbox"/>	8.3%	1
answered question			12
skipped question			0

7. What type of software, GIS, or other program does your department use to document your pre-incident plans? Mark all that apply.

		Response Percent	Response Count
Arc view	<input type="checkbox"/>	8.3%	1
Cad Zone-Fire Zone	<input type="checkbox"/>	25.0%	3
Visio	<input type="checkbox"/>	50.0%	6
Other CAD drawing program	<input type="checkbox"/>	8.3%	1
A Geographical Information System (GIS) based program	<input type="checkbox"/>	8.3%	1
Pictometry	<input type="checkbox"/>	8.3%	1
Hand drawn	<input type="checkbox"/>	25.0%	3
answered question			12
skipped question			0

8. If you checked other CAD drawing program, GIS or Pictometry for question 7, please list the program you use and any feedback you can provide on it.

	Response Count
view	3
<i>answered question</i>	3
<i>skipped question</i>	9

	Response Count
view	5
<i>answered question</i>	5
<i>skipped question</i>	7

	Response Count
view	12
<i>answered question</i>	12
<i>skipped question</i>	0

[Anti-Spam Policy](#) [Terms of Use](#) [Privacy Statement](#) [Opt Out/Opt In](#) [Contact Us](#)

Copyright ©1999-2008 SurveyMonkey.com. All Rights Reserved. No portion of this site may be copied without the express written consent of SurveyMonkey.com. 37

Appendix B

Links for Pre-Incident Planning Forms

Aiken County, S.C. Hazardous Materials Team. Retrieved

December 27, 2008, from [http://www.](http://www.hazmatteam.com/Preplan.htm)

[hazmatteam.com/Preplan.htm](http://www.hazmatteam.com/Preplan.htm)

Delta, British Columbia, Canada Fire Department, Retrieved

December 27, 2008, from

[http://www.deltafire.ca/PDFs/PrePlan/Pre-](http://www.deltafire.ca/PDFs/PrePlan/Pre-Incident%20Plan.pdf)

[Incident%20Plan.pdf](http://www.deltafire.ca/PDFs/PrePlan/Pre-Incident%20Plan.pdf)

First Look Pro, Retrieved December 27, 2008, from

<http://www.cadzone.com/firstlookpro/flp4.htm>

http://www.cadzone.com/firstlookpro/flp_fire_features.htm

International Association of Firefighters, Retrieved December

27, 2008, from <http://www.iaff.org/et/HW>

[/PDF/Tech%20Module%2004%20Student%20Text.pdf](http://www.iaff.org/et/HW/PDF/Tech%20Module%2004%20Student%20Text.pdf)

Kingsville, Ontario, Canada Fire Department, Retrieved

December 27, 2008 from [http://www.kingsvillefire.](http://www.kingsvillefire.ca/Pre-plan_Form.pdf)

[ca/Pre-plan_Form.pdf](http://www.kingsvillefire.ca/Pre-plan_Form.pdf)

Mercer County, Kentucky Fire Department, Retrieved December

27, 2008 from <http://mercercountyfire.com/forms>

[/MCFPD%20Building%20Preplan%20Form.pdf](http://mercercountyfire.com/forms/MCFPD%20Building%20Preplan%20Form.pdf)

Tempe, Arizona Fire Department, Retrieved December 27, 2008

from <http://www.tempe.gov/fire/FirePrevention/>

[01-04%20Pre-Plan%20New%20Construction%20Package.doc](http://www.tempe.gov/fire/FirePrevention/01-04%20Pre-Plan%20New%20Construction%20Package.doc)

Appendix C


Newly Developed BPFDP Pre-Incident Planning Forms

Pre-incident Planning Procedures

- Contact Owner/Agent:** Company officers will contact the business or facility prior to conducting the scheduled pre-incident plan.
- Forms:** The companies will bring copies of blank pre-incident planning forms to complete when on site that includes: blank pre-plan data sheet, blank site plan sheet, pre-plan symbols page, pre-plan instructions, drawing paper, graph paper and writing instruments.
- Additional equipment:** All companies will also bring a measuring device that includes a measuring wheel and tape measure.
- Form completion:** The site information sheet will be completed by obtaining the necessary information from the owner, agent or manager. The site plan will be conducted by performing the pre-incident plan by walking through the occupancy with the building owner or agent.
- Special notes:** Special notes should be made on the supplied forms that include all fire protection devices, sprinklers, fire department connections, hydrants, stand pipes, fire alarm panel, annunciators, fire pumps skylights, ventilation ducts, pressurized stairwells, skylights, elevator shafts, and dumbwaiters. Additionally, all utility shutoffs shall be located that includes gas, electric, water, or fueled devices and machinery.
- Site Drawing:** Complete the site drawing identifying appropriate addresses and locations of utilities that enter the building. For multiple occupancies in one building (strip malls) provide each unit address and their utility locations. Provide the road(s) intersections and indication of true North (N). A rough drawing is sufficient while at the site, a more detailed and scaled drawing can be completed back at the station.

Beach Park Fire Department Pre-Incident Planning Instructions Page

1. Make contact with building owner/agent/manager prior to conducting the pre-plan survey and arrange a time that is convenient for the business owner/agent.
2. Gather the forms needed to complete a pre-incident survey that include:
 - i. Blank pre-plan data worksheet
 - ii. Blank pre-plan site plan worksheet
 - iii. Symbols page
 - iv. Additional paper as needed (plain and graph)
 - v. Writing devices (pens/pencils/markers/etc)
3. Check for existing pre-plans on file prior to completing pre-plan and take with as needed.
4. Bring measuring devices that include walking wheel and tape measure(s).
5. Meet with the building owner/agent and inform them of the pre-plan procedures. Assure them that this is **NOT** an inspection and will be used only for possible emergency action should a fire or other hazardous condition exist in their occupancy.
6. Complete a pre-plan survey of the premises that includes either a top down or bottom up approach to view the entire occupancy.
7. Complete the necessary pre-plan written forms and site plan drawing of the premises as the survey is conducted.
8. Identify and list all business information, construction types, fire protection systems, utility locations, special information and hazards by the completion of the on-site survey. Additionally, indicate roads, intersections, hydrants and indication of North direction on the site plan drawing.
9. If there are multiple floors, determine if multiple site plan drawings are needed for each layer. If floors are similar only one floor plan is needed.
10. Although this is a pre-incident planning survey, if severe life safety issues exist while conducting the pre-incident survey, help the owner/agent correct the issue on the spot, i.e. large amount of heavy boxes or material covering a means of egress, exit way or door.
11. Sign, date and provide a list of all personnel that participated in the pre-incident survey. Fill out a training sheet for the time present in conducting the survey.
12. Submit completed forms to the pre-incident planning officer.

 <h2 style="text-align: center;">Beach Park Fire Department Pre-plan Data Worksheet</h2>	
Business Information	Occupancy Name _____ Preplan Number _____ Address _____ _____ Business Phone _____ Fixed property use _____ Type of ownership Private ___ Village ___ County ___ State ___ Federal ___ Foreign ___ Military ___ Dimensions Height _____ Number of stories _____ Length _____ Width _____
	Construction Type I ___ II ___ III ___ IV ___ V ___ Explanation _____ Wood Frame exterior walls ___ Concrete/Block/Brick/Masonry exterior walls _____ Building under construction ___ Occupied ___ Vacant ___ Basement Yes ___ No ___ Access location _____ Roof Construction Wood frame ___ Wood truss ___ Steel truss ___ Steel bar truss ___ Roof covering Asphalt shingle ___ Tar and gravel built up ___ Other _____ Roof access Yes ___ No ___ Location _____ Attic Access Yes ___ No ___ Location _____
Construction Type	Detectors Present Yes ___ No ___ Type Heat ___ Smoke ___ Combination of both ___ Rate of rise ___ Sprinkler Protection Yes ___ No ___ Partial Protection ___ Fully Sprinklered ___ Area coverage _____ Wet pipe system Yes ___ No ___ Deluge system Yes ___ No ___ Dry system Yes ___ No ___ Location _____ Hood and Duct System Yes ___ No ___ Location _____ Type _____ Fire Pump Yes ___ No ___ Location _____ Fuel/Energy type Gas ___ Diesel ___ Electric ___ Standpipe(s) Yes ___ No ___ Location _____ Fire Department connection Yes ___ No ___ Location _____ Annunciator Yes ___ No ___ Location _____ Alarm Panel Yes ___ No ___ Location _____ Alarm Company _____ Phone _____ Pull stations Yes ___ No ___ Locations _____ Knox Box Yes ___ No ___ Location _____
	Utility Locations Gas shut off _____ Electric shut off _____ Water shut off _____ Other fueled shut off _____ Sprinkler system shut off _____
Fire Protection Systems	Emergency contact information Owner Name _____ Phone _____ Building Management _____ Phone _____ Maintenance Manager _____ Phone _____ Other contact _____ Phone _____
	Special Hazards/Chemicals/Hazardous Materials/Life Safety/Exposures _____ _____ _____
Utility Locations	
Special Information	
Hazards	
Completed By _____ Shift _____ Date _____	



Beach Park Pre-Planning Site Plan Worksheet



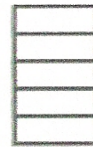
Occupancy Name _____

Occupancy Address _____

PRE-PLAN SYMBOLS



ANNUNCIATOR



STAIRS



KNOX BOX



DIRECTIONAL



FIRE ALARM PANEL



HYDRANT



GAS SHUT OFF



F.D. CONNECTION



ELECTRICAL SERVICE



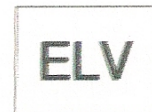
STANDPIPE



DOORS



DOUBLE DOORS



ELEVATOR

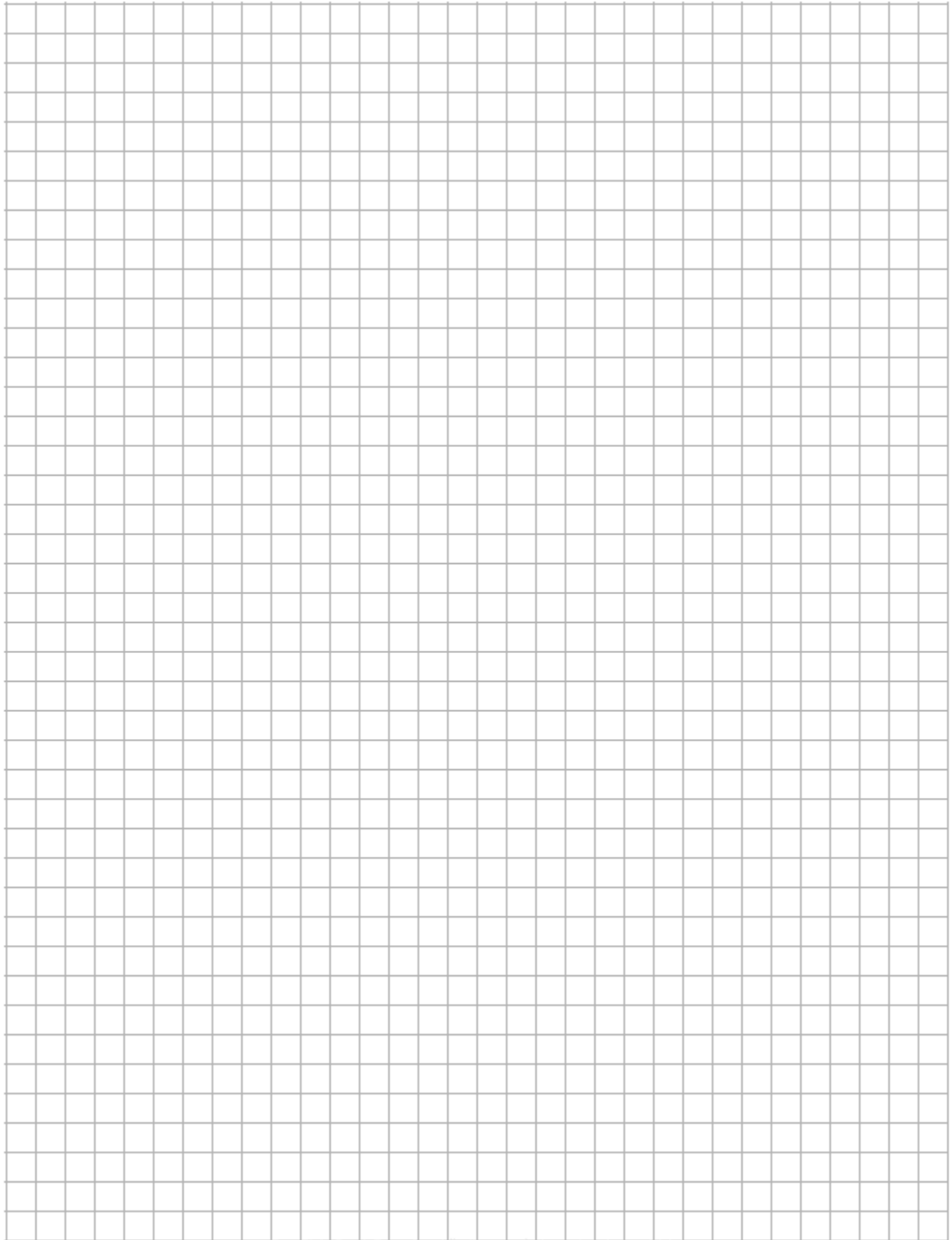


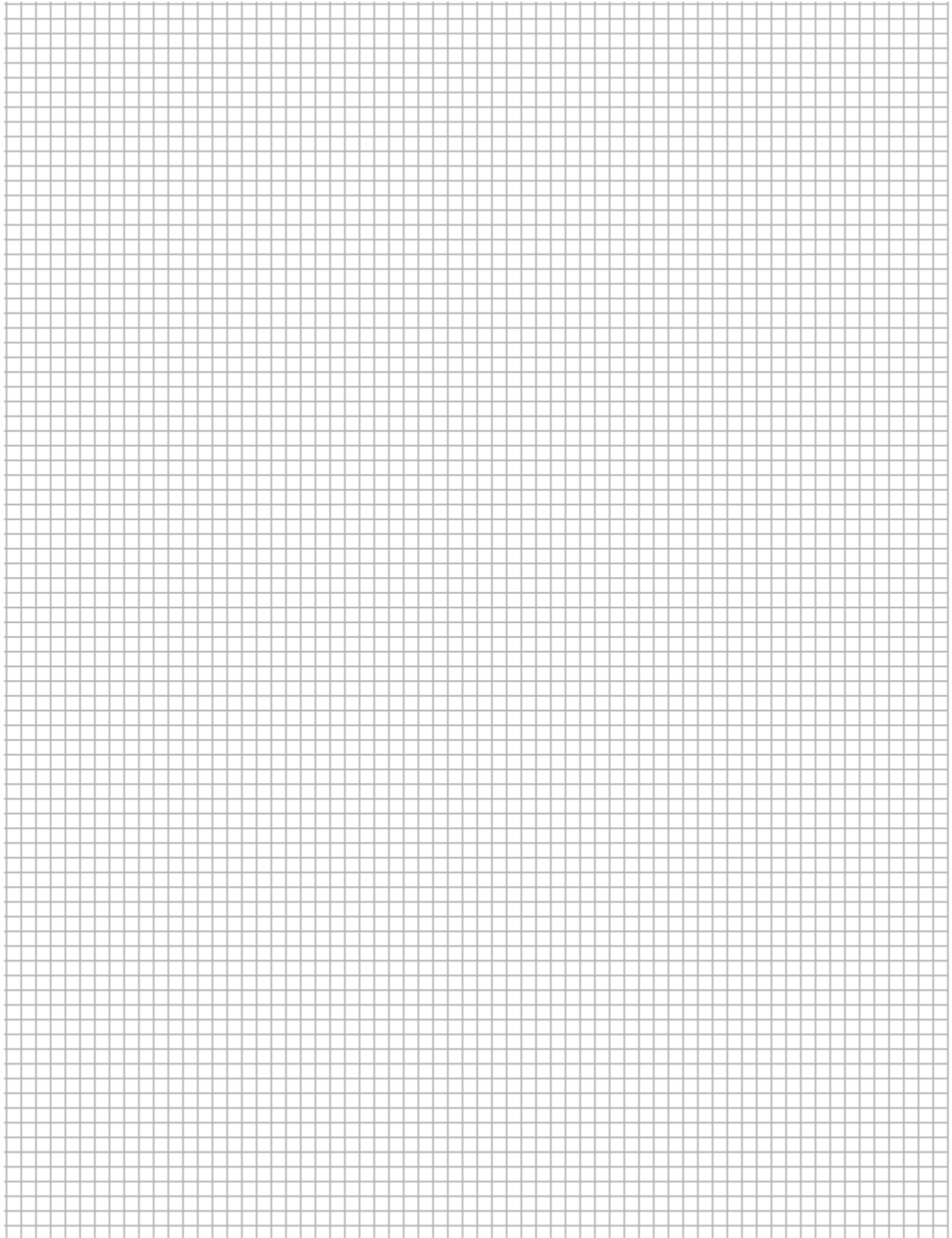
OVERHEAD DOOR



ROOF ACCESS

Copied with permission from the
Waukegan Fire Department, Waukegan, IL





Appendix D

Questionnaire and Results from Software Evaluation

Questionnaire

Cad Drawing Program Evaluation(s)

Based on your experience with the recent training exercises using the two evaluation software products (Cad Zones Fire Zone and Visio) please answer the following questions and place the completed survey in Asst. Chief Howards mail box.

1. Did you have the opportunity to use both software drawing programs?

Yes

No

2. If you answered yes to question 1, which program did you feel was easier to use or learn?

Fire Zone

Visio

3. What aspects or features did you like about Fire Zone? _____

4. What aspects or features did you like about Visio? _____

5. Which product do you feel would work best for our pre-incident planning program and why? _____

6. Would you be interested in participating in the pre-incident planning program, if so in what capacity?

A. Committee member

B. Drawing Pre-plans

C. Entering Data

D. Not Interested

7. Did you feel the training provided new, realistic and useable information for pre-plan applications? _____

NAME _____
(optional if you would like to be contacted for assistance with the Pre-plan program)

Questionnaire RESULTS

Cad Drawing Program Evaluation Results

The following information is the results of the software based evaluations by the Beach Park Fire Department members. Twenty surveys were distributed and 7 were returned for a 35% return rate.

1. Did you have the opportunity to use both software drawing programs? (N= 20)

Yes 6 No 1 Total returned surveys 7

2. If you answered yes to question 1, which program did you feel was easier to use or learn?

Fire Zone 2 Visio 4 No response 1

3. What aspects or features did you like about Fire Zone? Collective comments included:

Cad based program, easy to use, lots of symbols, precision and specifics, symbols easy to find, more user friendly, fire zone relates more to NFPA standards, more firefighting applications.

4. What aspects or features did you like about Visio? Collective comments included: Easy

to use, liked click and drag format, user friendly, more user friendly, easy to navigate, less confusing, ease of building walls, easy to click and drag, already have the program, easier to use.

5. Which product do you feel would work best for our pre-incident planning program and why?

Fire Zone. 2, Fire Zone because it is a CAD program, more symbols.

Visio 4, Visio easier, components easier to use.

No response. 1. Let those that will use it decide.

6. Would you be interested in participating in the pre-incident planning program, if so in what capacity?

A. Committee member 2 B. Drawing Pre-plans 2

C. Entering Data 1 D. Not Interested 3

7. Did you feel the training provided new, realistic and useable information for pre-plan applications?

Yes 7 No 0 Other 0

NAME 4 individuals supplied their names.

(optional if you would like to be contacted for assistance with the Pre-plan program)